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INTRODUCTION AND OVERVIEW OF THE  
VICENS-REDDY SPEECH RECOGNITION SYSTEM

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# TECHNICAL MEMORANDUM

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INTRODUCTION AND OVERVIEW OF THE  
VICENS-REDDY SPEECH RECOGNITION SYSTEM

by

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4 December 1970

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#### ABSTRACT

This document provides an introduction and overview for the document series TM-4652, Analysis and Development of the Vicens-Reddy Speech Recognition System.

1. INTRODUCTION

For about a year, SDC has been involved in a program of development of voice communication with the computer. This has included studies of both automatic speech recognition and speech synthesis. Initial investigations have indicated that one of the most successful speech recognition systems was developed by Pierre Vicens (under the direction of Raj Reddy) on the PDP-10 computer at Stanford University. It was decided to implement this system on the IBM 360/67 at SDC to provide a base for further development.

This particular system is unique in the sense that it approaches the problem of speech recognition as a whole, rather than treating particular aspects of the problem as in previous attempts. For example, where earlier systems treated only segmentation of speech into phoneme groups, or detected phonemes in a given context, the Vicens-Reddy system processes the incoming speech signal, applies heuristics to segment the signal and to identify phoneme-like units and then uses the total phonemic pattern to recognize an entry in the lexicon.

The Vicens-Reddy system can be divided into six parts: (1) hardware preprocessing, (2) software preprocessing, (3) segmentation, (4) recognition, (5) lexicon development, and (6) lexicon usage. Preprocessing involves digitizing and normalizing the raw voice input. The output of the preprocessing is an array, called the Q-matrix, whose rows are the amplitudes and zero-crossing counts of the raw voice input over 10 ms. time periods.\* Segmentation applies heuristics to combine the minimal segments of the above Q-matrix into larger transitional or sustained segments of a new array, called the P-matrix. Recognition applies heuristics to the P-matrix in classifying sustained segments into phoneme-like groups (fricative, vowel, stop, nasal, consonant or burst) and produces the R-matrix or feature matrix. The lexicon development involves the addition of the feature matrix from the previous recognition process into the lexicon. In lexicon usage, the feature matrix from the recognition process is used to achieve the best match in the lexicon.

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\* A 10 ms. time period will be referred to as a minimal segment throughout.

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Some amount of speech research at SDC will be based on this program. Such research requires detailed explanations of the various heuristics used in the program. However, the available documentation is not complete. This series of documents will begin with a detailed description of the Vicens-Reddy system, along with explanations for a large number of previously unexplained heuristics used in the program. Later documents will describe various modifications to the system.

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